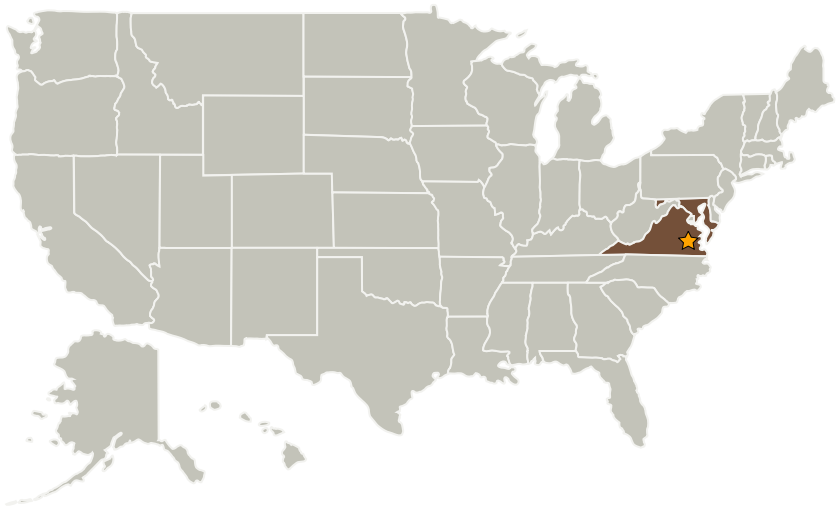
Upset Prevention and Recovery for Unimpaired and Impaired Aircraft, Phase II

Completed Technology Project (2009 - 2011)

Project Introduction

The objective of the project is the development of an on-board envelope estimation, protection and upset recovery tool to address loss of control incidents in commercial aircraft. Loss of control incidents can be attributed to variety of factors including environmental (icing, clear air turbulence, wakes, etc.), failure of aircraft components (stuck control surfaces, failure of hydraulic systems, broken cables, etc.), human factors (pilot error, insufficient training, crew distraction, etc.) or a combination of any of them. Usually the final catastrophic event is linked to nonlinear phenomenon (like stall) and there is a small time window of opportunity for the pilot (or the flight computer) to recover but the action they take are critical to any such recovery. In Phase I, we have demonstrated how nonlinear equilibrium analysis can be brought to bear upon this problem to understand the dynamic behavior of the aircraft outside of the nominal operating regime. We have also shown using NASA Generic Transport Model (GTM) how such tools may be used to dynamically estimate the operational envelope of the aircraft. In Phase II, we will extend the methodology to design an on-board envelope protection system and study upset recovery schemes. The analytical tools will be supported by the development of commercial grade software for on-board envelope estimation and upset recovery for unimpaired and impaired aircraft. We have already implemented symbolic tools for modeling and analysis, database management, numerical validation and visualization. These tools will be extended, improved and evaluated experimentally. Our goal is to provide verifiable software for commercial aircraft flight safety.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Techno-Sciences, Inc.	Supporting Organization	Industry	Beltsville, Maryland

Primary U.S. Work Locations	
Maryland	Virginia

Project Transitions

December 2009: Project Start

December 2011: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX16 Air Traffic Management and Range Tracking Systems
  - TX16.4 Architectures and Infrastructure